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to publishing their articles exclusively in journals in their own tongue, and it thus becomes very difficult to follow their researches.

All who have interested themselves in proto-historic European ethnology are aware of the obscurity that reigns over the relationship of the early Slavonic tribes; it is only one degree better than the quite impenetrable fog surrounding the Celts. Their craniology is wholly conflicting; and to-day, if an anthropologist were to speak of "the Slavonic type," I should not have any idea whether he meant a blonde or a brunette, a long skull or a broad skull, a short or a lofty stature, narrow or wide eyes. The Slavonic languages, however, are permanent testimonies to a former linguistic unity.

LETTERS TO THE EDITOR.

⁂ *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

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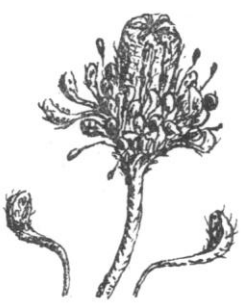
The editor will be glad to publish any queries consonant with the character of the journal.

A Gynandrous Flower-Head.

A GYNANDROUS flower-head of the Iceland poppy is now in my possession. The ordinary seed-case is perfectly formed, including the stigmas. Round it are what should be the stamens; but twenty or more of these are thickened gradually upwards from the base of the filament, ending in a golf-club-like head. On the outer side some of these have anthers more or less completely developed; but in all the inner side is concave, containing three to fifteen or more ovules attached round the edge. The sketch will assist in explaining this extraordinary botanical monstrosity.



POPPY MONSTROSITY.

J. EDMUND CLARK.

York, England.

Is There a Sense of Direction?

A RECENT article in *Science* by the facile pen of Dr. Hall on the "Sense of Direction" concedes the absence of such a faculty in civilized man at least, and possibly also in the semi-civilized as well; but he believes beyond cavil that the lower animals do have this gift denied to man.

That which appears to be a "sense of direction" in animals can, I believe, in every case be explained by the power of observation and memory, or by accident.

Men and animals alike, under given circumstances, are compelled to both observe and remember, until the one becomes as easily and unconsciously done as the other, and, for all the purposes of this article, the memory to have existence must be established upon facts learned by observation. It is very well known that an unguided horse returning to familiar haunts will do so over the same route by which he left them, rather than in a direct line by sense of direction. The very few instances recorded of animals returning from incredible distances, over which they had been carried, can doubtless be explained by their having been able to observe the route travelled, or by accident, or by the fact of their being unauthenticated nursery tales, with the possible exception of the homing pigeon, birds of wonderful flight and sight, many of which never reach home, while the arrival of many more is unaccountably delayed. Their ability to return is, I believe, no more fully explained than is the no less wonderful one of the wild water-fowls, which are taught to fly north in spring and south in autumn, or why they fly low one season and high the next, possibly in both instances determined by the character of the upper air-currents.

The case, instanced by the doctor, of the Mexican sheep-herder's ability to minutely describe travellers who had passed days previously might very aptly be used to illustrate the similarity of the mental processes necessary alike in man and animals in the matter of direction. The Mexican herder saw the travellers, to him an unusual sight, his mental perception, unoccupied by impressions other than those caused by these travellers, accurately photographed on his mind, as upon the sensitive plate of the camera, every feature of the outfit. In the case of the man, he perceived as well as saw, and could again reproduce the picture, call it up for the inspection of the mind's eye at will; but in the case of the brute that which has been seen has passed beyond possibility of recall, except by the stimulus of the same impressions repeated, when the impression is recognized as familiar. This is brute memory, possible only as a result of having seen or felt, and capable of being reproduced only by the same external agencies, and their so-called "sense of direction" is rather the faculty of recognizing at sight as familiar that which has already been seen.

If the sense of direction be inherent in animals, we would naturally inquire why it is not exhibited before they have reached mature age and been taught by experience, for it is a matter of common observation with those familiar with domestic animals that the stable-reared animal of whatever species is utterly lacking in anything bearing the faintest semblance to a sense of direction; and it is a fact within the common knowledge of most farmers' boys that cats, foragers by instinct and practice, may be carried a very few miles in a sack and never return, and that the barn-yard cock will not return from a distance of one hundred rods, although mercilessly maltreated by his new associates, for his sense of direction is determined by sight only.

All admit that many animals can and do return to their homes, but the explanation of their ability to do so need not be sought and developed by an intricate process of reasoning, if it is, as we believe, necessary that the animal first traverse the road before it can with certainty return. And in conclusion it is sufficient for me to say that, whatever instincts animals may have in this direction, man has the same, with the additional faculty of reason. In both, observation and memory can be highly cultivated, in the animal by necessity alone, and in both by experience only.

Pueblo, Colorado. H. WORK.

Laboratory Teaching.

A RECENT number of *Science* contained a note by Professor William P. Mason referring to a statement of mine concerning the early years of laboratory teaching in chemistry. I need not state that I had no intention of withholding credit from any of the pioneers in the development of scientific education, especially from such institutions as the Rensselaer Polytechnic Institute, which, as everyone knows, from the first has been in the foremost rank. I had in mind the course of laboratory instruction in general chemistry which was established for the training of large classes at the Massachusetts Institute of Technology by Professors Eliot and Storer. This method of instruction, adapted to later advances in knowledge and to the needs of individual laboratories, is now in very general use in teaching elementary chemistry.

CHARLES F. MABERY.

Animal Phosphorescence.

ALL sorts of theories have been advanced to explain generally the real use of these luminous emanations. Some have supposed that the light is intended as an effective aid to the night birds that feed upon this gorgeous fare. But that would certainly be a left-handed provision of nature, quite out of her usually kindly protection. Others, again, guess that the firefly's flash-light is a device to assist him in the search of his own prey. With none of these theories, however, is science fully satisfied, and in the judgment of the most prudent naturalists the real use of the luminosity of these insects is still utterly unknown.

Can any of the readers of *Science* give me "a great light" on the subject in dispute? CHARLES NIEDLINGER.

New York, 5 East 16th St., Sept. 26.

BOOK-REVIEWS.

An Account of the Principal Facts and Theories Relating to the Colors and Markings of Animals. By FRANK E. BEDDARD, M.A. New York, Macmillan & Co. 8°. $3.50.

THERE is significance in the number of recent works involving a discussion of questions of biological philosophy and a presentation of fundamental principles to intelligent non-scientific thinkers. Starting with Darwin's "Origin of Species," a steadily increasing volume of this kind of literature has been produced to supply an intellectual demand, in itself a grateful proof of the re-adjustment and betterment of the relations between scientists and other thinkers.

Among these newly developed lines of thought, none is more interesting than the significance of coloration in the organic world; and none deals with a subject more intrinsically beautiful. The work under review is an attractive book on an attractive subject. The press-work is good, the type clean and sufficiently large. The four colored plates are a feature which will be much appreciated, while the wood-cuts are well selected and well executed, with the exception of the illustration of the sloth, which is little short of execrable.

The classification of colors according to their supposed purpose is much less intricate than that adopted by Poulton, and not very unlike that of Wallace. A compromise between Poulton and Beddard would have its advantages. Contrary to the promise of the author in the introductory chapter, he has used insects almost, if not quite, as much as Poulton in the presentation of his subject. The author says that his book "contains nothing novel," but we think that he is over modest in this, for his excellent series of experiments for the purpose of determining the palatability of various animals is both new and very much to the point.

In the introductory chapter the origin of animal coloration is explained, and an indication of the anti-Darwinian trend of the work is furnished by a denial of the fact that coloration is always in harmony with the mode of life of the animal, a question which might still be left *sub judice*. Albinism is considered an individual variation, although there is much to indicate that it is a physiological weakness or dermal disease. Although Mr. Beddard does not touch upon the transmission of acquired characters, perhaps thereby showing his wisdom, he is evidently intensely Lamarckian in his beliefs. A comparison between Wallace's "Darwinism" and Beddard's "Coloration of Animals" would be instructive perhaps, but sorely perplexing to the general student, who cares more for ascertaining the truth than being *au fait* in theories. Natural selection is apotheosized by the former, while no author is more persistent in his attempts to minimize the effects of natural selection than the latter. Here again middle ground would seem more safe.

Our author concludes that "the brilliant and varied coloration of deep-sea animals is totally devoid of meaning," a conclusion that will doubtless meet with considerable opposition.

Chapter II., on coloration as affected by environment, is a thoroughly Lamarckian chapter with many significant facts. The nature and quantity of food is held to materially affect coloration. Moisture deepens colors, while a dry climate lightens them. The white of Arctic animals, it is maintained, is due to environment, although this proposition can hardly be said to be substantiated in a satisfactory manner.

In Chapter III., on protective coloration, this well-worn but never tiresome subject is illustrated by a large number of examples in much the usual way. The author is surprised at the small number of green animals frequenting trees. We are inclined to think the number much greater than he admits. For instance, a

Publications Received at Editor's Office.

BAILEY, L. H. The Horticulturist's Rule-Book. New York, Rural Pub. Co. 12°. 221 p.

JOHNSON, WILLIAM W. The Theory of Errors and Method of Least Squares. New York, John Wiley & Sons. 12°. 162 p. $1.50.

MACCORD, CHARLES W. Mechanical Drawing. New York, John Wiley & Sons. 4°. 100 p. $4.

MERRIMAN, MANSFIELD. A Text-Book on the Method of Least Squares. 6th ed. New York, John Wiley & Sons. 8°. 206 p. $2.

MERRIMAN, MANSFIELD. An Introduction to Geodetic Surveying. Part 1. The Figure of the Earth. New York, John Wiley & Sons. 8°. 170 p. $2.

MILNE, WILLIAM J. Standard Arithmetic. New York, American Book Co. 12°. 428 p. 65 cts.

POOR, HENRY V. The Tariff. New York, H. V. & H. W. Poor. 8°. Paper 121 p.

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To exchange for books on birds or insects, or for back volumes of American Naturalist: Ecker's "Anatomy of the Frog," Packard's "Guide," Guyot's "The Earth and Man." Rockhill's, "The Land of the Lamas," Parker's "Biology," Shoemaker's "Heredity, Health and Personal Beauty," Dexter's "The Kingdoms of Nature," all new. M. J. ELROD, Ill. Wes. Univ., Bloomington, Ill.

For Sale.—About 1087 volumes of the private library of Dr. Nicolas León, formerly director of the Museum at Morelia, embracing publications of special value for Mexicologists, like those of Bishop Zumárraga (16th century), of Siguenza y Gongora, of Aleman, etc., the Missal of Spinoza, all very scarce; manuscripts on the history of Michoacán and other Mexican States, on the Tarasco (the Indian language of Michoacán) and several works, of which the only copy known to exist is in this collection. Parties interested in the sale please address DR. NIC. LEÓN, Portal de Matamoras, Morelia, Mexico.

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